Shin Soreness

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Research in musculoskeletal disease of Thoroughbreds has reported that over 50% of horses suffer from at least one illness or injury during their two- and three- year old racing season [1, 2]. Shin soreness was the most common problem affecting over 30% of the horses at least once. Each case of shin soreness was associated with an average of 12 weeks resting at pasture [2].

Definition of shin soreness

- A low-grade training injury that affects the upper dorsal aspect of the shin or third metacarpal bone and is characterised by pain on palpation [3].
- Reported to be highest in two-year-old racehorses [1, 4].
- Shin soreness may be associated with an unwillingness to work at speed and continued training may lead to diffuse soft tissue swelling visible on the dorsum of the metacarpus.

Known factors contributing to shin soreness

- **Bone strength**
    - The strength of the bone will influence its ability to withstand repeated loading.
- **Fatigue/Muscle Fatigue**
    - The ability of the muscle to delay fatigue may play a role in the onset of shin soreness [2].
- **Training/track surfaces**
    - Training distance at speeds greater than 890 metres per minute and previous exposure to training has been shown to affect the incidence of shin soreness [2].
    - Training surfaces have long been considered a contributing factor to shin soreness [5].
        - Track geometry may also be a contributing factor. Increasing the radius of corners and the degree of banking and placing inclines in straight stretches may be useful in reducing low grade lameness such as shin soreness.

Nutritional/Management strategies to reduce the incidence of shin soreness

By analysing the issues that contribute to the factors presented above, it may be possible to implement nutritional and management strategies to reduce the incidence of shin soreness in racing.

Factor 1: BONE STRENGTH

Bone strength is the toughness or ability to endure stress; therefore is related to the ultimate load or stress at which bone will break. Because bone mineralisation provides compressional strength to bone, the bone mineral content (which is a measure of the amount of mineral in a bone) is an important determinant of bone strength during the development phase of an animals life [6, 7]. In humans, bone having the highest percentage mineral content with a large cortical area were shown to have the greatest strength [8].

Diet

Calcium

Current National Research Council (NRC) recommendations for dietary calcium are 0.3% for maintenance and 0.32% for very heavy work (i.e. racing requirements)[9]. Supplementation of calcium has not been shown to be effective in preventing a decrease in bone mineral content during deconditioning or resting [10]. However, bone mineral content did increase in horses supplemented with additional calcium during conditioning, compared to horses fed a control diet (levels recommended by the NRC). ***Thus, calcium supplementation above currently recommended levels increased bone mineral content in conjunction with conditioning but not in the absence of conditioning.***

Vitamin D plays a vital role in the regulation of calcium and phosphorus metabolism and has a major regulatory role in bone metabolism and strength. Several studies in humans have shown vitamin D and calcium supplementation to significantly reduce fracture rates and bone loss [11, 12]. ***Aside from vitamin D, vitamins B6, C and K have been shown to be integral to bone health because of their involvement in the synthesis of matrix constituents such as collagen and osteocalcin and formation of collagen crosslinks [13].*** Nutrient intakes of potassium, protein and lutein were also found to be significantly associated with bone mineral density [14] and a deficiency of copper has been shown to decrease collagen crosslink formation and to lower mineralisation [15].

Factor 2: FATIGUE/MUSCLE FATIGUE

In humans, muscle activity has been shown to partially attenuate the large bending movement and reduces the tensile and compressive stress applied to the tibia [16]. Laboratory studies in the horse have shown that an inability to attain a previous maximum exercise speed in a subsequent run within the same exercise period is associated with an increase in bone strain [17]. Therefore the ability of the muscle to delay fatigue may play a role in the onset of shin soreness. Adequate nutrients including energy, protein, minerals and vitamins will assist in reducing the risk of fatigue.

Factor 3: TRAINING

A recent RIRDC funded project investigated the relationship between daily exercise training and shin soreness [2]. Their results and recommendations are shown below:

- **Training distance at speeds greater than 890 metres per minute**
  - Increasing the average weekly distance trained at speeds greater than 890 metres per minute was found to increase the risk of shin soreness. The authors suggested that during the first nine weeks of a preparation the average distance worked at speeds greater than 890 metres per minute should be limited to 200 metres per week. After week nine it should be possible for horses to complete 400 metres per week of speeds greater than 890 metres per minute.

- **Previous exposure to training**
  - Horses that had trained at speeds of greater than 890 metres per minute during the previous preparation were at less risk of shin soreness in their next preparation. This suggests that there may be benefits to horses having a short preparation that included gallops at speeds greater than 890 metres per minute over a distance of not more than 200 metres per week. It is likely that such preparations promote adaptation of bone, increasing its ability to cope with the demands of exercise at those speeds. The aim of these preparations is to encourage the bone to adapt to high speed exercise.

- **Age**
  - Horses that developed shin soreness were 28 months of age at the start of the preparation whilst those that did not were 30 months of age. This suggests that delaying the commencement of training for horses born later in the foaling season may reduce the likelihood of injury.

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